

**INDIANA DEPARTMENT OF TRANSPORTATION  
MATERIALS AND TESTS DIVISION**

**Method of Test For  
BULK SPECIFIC GRAVITY of AGGREGATE BLENDS with RAP  
ITM No. 584-04T**

**1.0 SCOPE.**

- 1.1 This test method covers the procedure to determine the bulk specific gravity (Gsb) of a combined aggregate blend with RAP used in an HMA mixture.
- 1.2 The values stated in either SI metric or acceptable English units are to be regarded separately as standard, as appropriate for a specification with which this ITM is used. Within the text, English units are shown in parenthesis. The values stated in each system may not be exact equivalents; therefore each system shall be used independently of the other, without combining values in any way.
- 1.3 This ITM may involve hazardous materials, operations, and equipment. This ITM does not purport to address all of the safety problems associated with the ITMs use. The ITM user's responsibility is to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

**2.0 REFERENCED DOCUMENTS.**

**2.1 AASHTO Standards**

PP-28 Standard Practice for Superpave Volumetric  
Design for Hot Mix Asphalt  
T-84 Specific Gravity and Absorption of Fine Aggregates  
T-85 Specific Gravity and Absorption of Coarse Aggregate  
T-100 Specific Gravity of Soils  
T-209 Maximum Specific Gravity of Bituminous Paving Mixtures

**2.2 ITM Standards**

ITM 207 Sampling Stockpiled Aggregates  
ITM 586 Binder Content by Ignition  
ITM 571 Quantitative Extraction of Bitumen and Gradation of Extracted  
Aggregate from Bituminous Paving Mixture.

**2.3 Other References**

SP-2 Superpave Level 1 Mix Design by Asphalt Institute

**3.0 TERMINOLOGY. Terms and Abbreviations.** Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101.

**4.0 SIGNIFICANCE AND USE.**

- 4.1 This ITM is used to determine the bulk specific gravity of a combined aggregate blend with RAP used in HMA mixture.
- 4.2 The bulk specific gravity ( $G_{sb}$ ) of a combined aggregate blend is calculated using an estimate of the bulk specific gravity of the aggregate in the RAP and the actual bulk specific gravity of the other aggregates.
- 4.3 The bulk specific gravity of an aggregate blend is used to perform a volumetric analysis on compacted HMA in accordance with AASHTO PP-28.

**5.0 APPARATUS.** Apparatus shall be as stated in the referenced test methods.

**6.0 SAMPLING.** Sampling shall be as stated in the referenced test methods.

**7.0 PROCEDURE.**

- 7.1 Identify the coarse aggregate(s), fine aggregate(s) and RAP selected for use in the Superpave mix design.
- 7.2 Identify and record the actual percentages for each of the aggregate components used in the combined aggregate blend of the Superpave mix design.
- 7.3 Obtain a representative sample of the coarse aggregate, fine aggregate mineral filler and RAP in accordance with ITM 207.
- 7.4 Determine and record the bulk specific gravity of each of the coarse aggregate(s) in accordance with AASHTO T-85.
- 7.5 Determine and record the bulk specific gravity of each of the fine aggregate(s) in accordance with AASHTO T-84.
- 7.6 Determine and record the maximum specific gravity of the RAP in accordance with T-209.
- 7.7 Determine and record the asphalt content of the RAP using ITM 571.

- 7.8** Calculate and record the effective specific gravity of the RAP aggregate.

$$G_{se} = \frac{100 - P_{bRAP}}{((100/G_{mmRAP}) - (P_{bRAP}/G_{bRAP}))}$$

Where:

$G_{se}$  = Effective specific gravity of the RAP aggregate

$P_{bRAP}$  = Percent binder of the RAP

$G_{mmRAP}$  = Maximum specific gravity of the RAP

$G_{bRAP}$  = Specific gravity of asphalt in the RAP (use 1.03 if unknown)

- 7.9** Calculate and record the bulk specific gravity of the combined aggregate blend as follows.

$$G_{sbBlend} = \frac{\%CA1 + \%CA2 + \%FA1 + \%FA2 + \%BHF + \%RAP}{\frac{\%CA1}{G_{sb}} + \frac{\%CA2}{G_{sb}} + \frac{\%FA1}{G_{sb}} + \frac{\%FA2}{G_{sb}} + \frac{\%BHF}{G_{sb}} + \frac{\%RAP}{G_{se}}}$$

Where:

$G_{sbBlend}$  = Bulk specific gravity of the combined aggregate blend.

$G_{sb}$  = Bulk specific gravity of each respective aggregate.

$G_{se}$  = Effective specific gravity of the RAP.

$\%CA1$  = Percent of aggregate blend that is course aggregate #1.

$\%CA2$  = Percent of aggregate blend that is course aggregate #2.

$\%FA1$  = Percent of aggregate blend that is fine aggregate #1.

$\%FA2$  = Percent of aggregate blend that is fine aggregate #2.

$\%BHF$  = Percent of aggregate blend that is bag house fines.

$\%RAP$  = Percent of aggregate blend that is RAP.

- 8.0 REPORT.** Report the  $G_{sb}$  of the combined aggregate blend to the nearest 0.001.